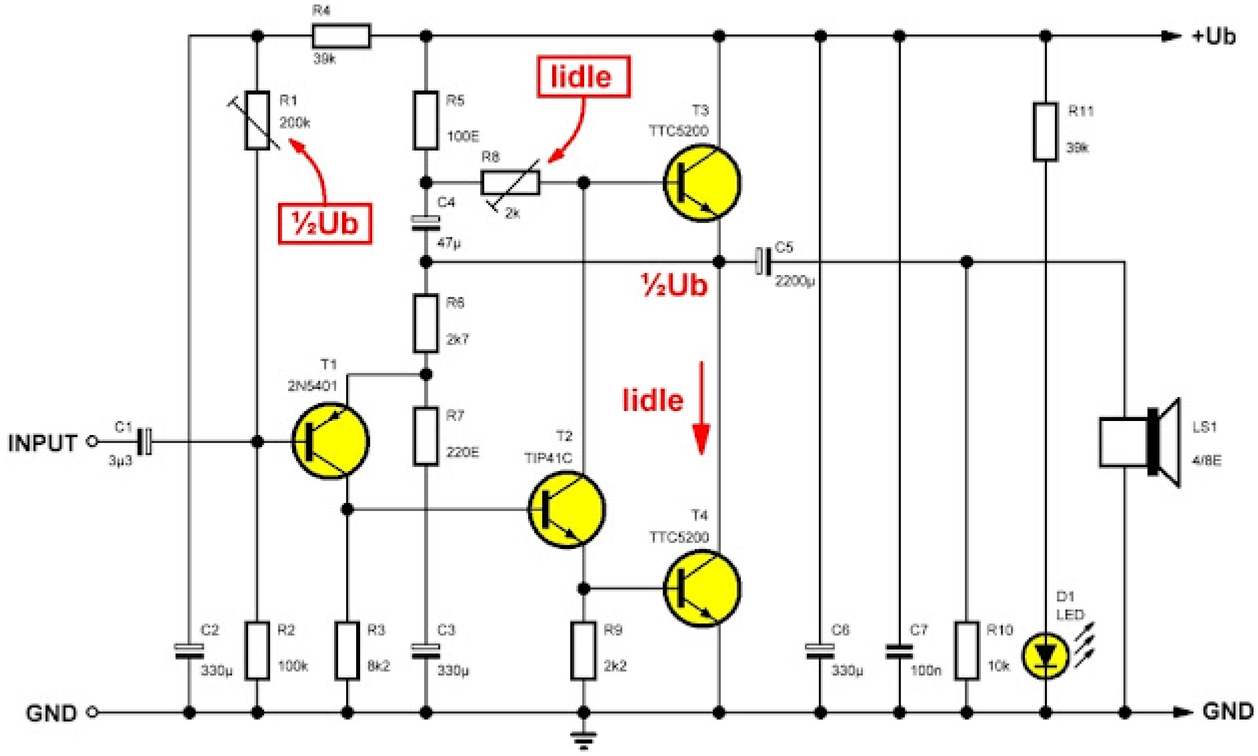
Linsley Hood 1969 Amplifier Kit

(Manual written by Jos Verstraten on 01/04/2022)

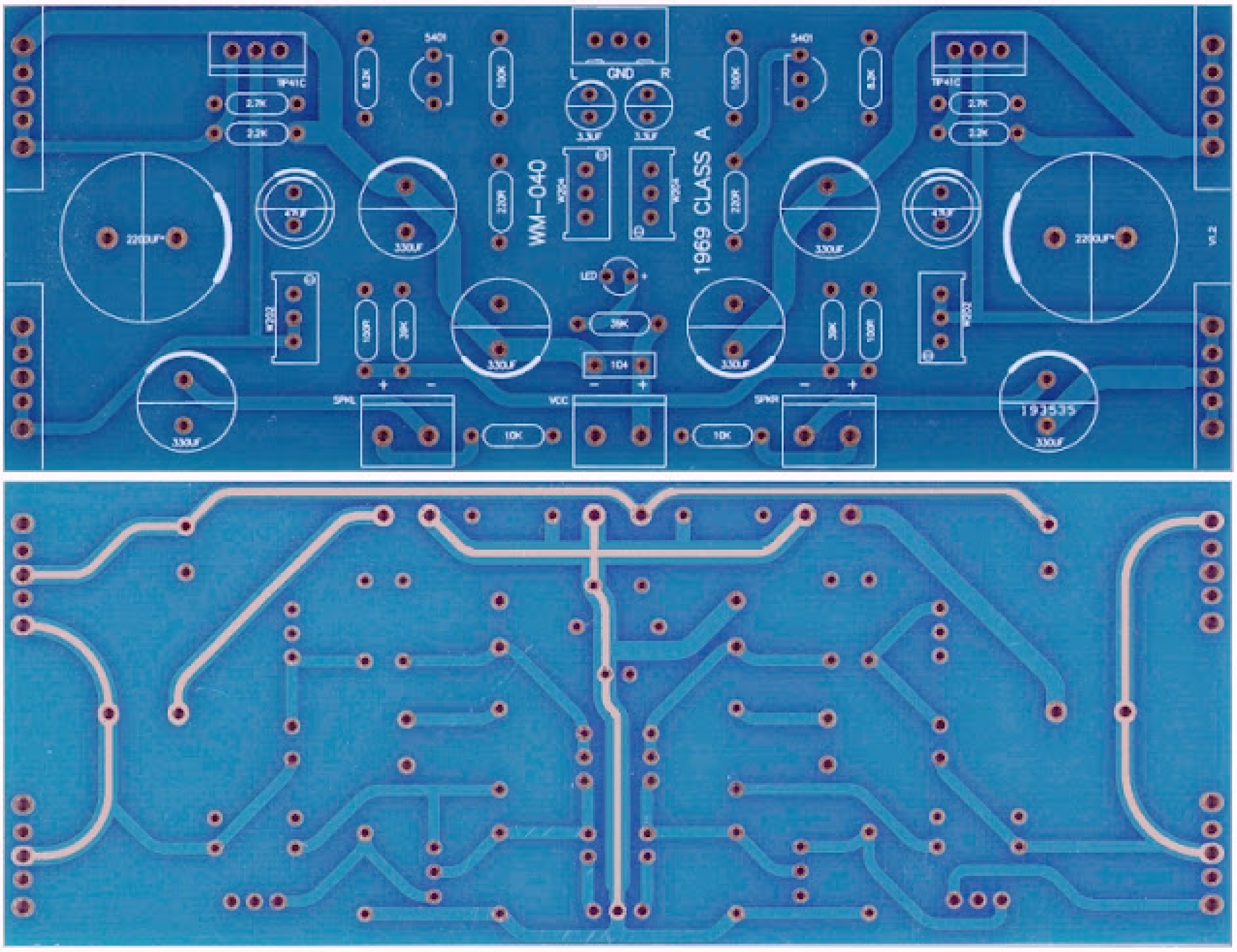
The schematic of the amplifier
If you have taken the trouble to download the original Linsley Hood 1969 article, you will see that the circuit is identical to the original, down to the smallest detail. Even the resistor values are identical! Only different types of transistors are used and it is remarkable that some resistors have a lower power than stated in the original diagram.
Capacitor C7 is only present once, the same goes for the LED and series resistor R11.



The schematic of the Linsley-Hood 1969 amplifier.

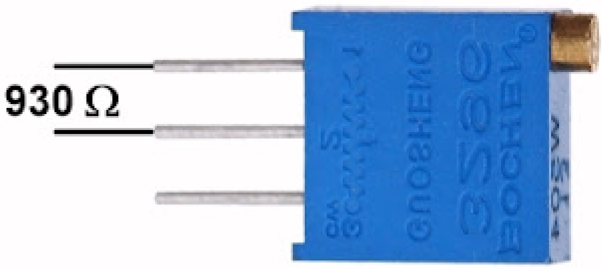
With the trimmer potentiometer R1 you can adjust the voltage between the two power transistors to half the supply voltage. R8 controls the value of the quiescent current through the output stage. Capacitor C4 is the so-called '*bootstrap*' capacitor that ensures that transistor T3 still receives sufficient driving current at the base at positive peaks of the output signal.
The resistors R6 and R7 are very important, because they provide the only feedback present in the amplifier. The ratio between these two resistors not only determines the voltage gain of the circuit, but also the current stabilisation of the whole. This works as follows. If one of the power transistors is conducting more or less than intended, the voltage at the junction will deviate from ½Ub. This deviation will influence the conductance of transistor T1 via resistor R6. The voltage across resistor R3 varies and this in turn causes a deviation in the conductance of T2. The voltage across R9 will then also vary, resulting in the conductance of the transistor T4 being adjusted to compensate for the original imbalance.

The printed circuit board for the amplifier
This is double-sided and there is nothing to complain about. On one side, some tracks do not have a full solder mask. The intention is undoubtedly to make these tracks '*thicker*' by applying a layer of solder. However, not all tracks of the output stage are equipped with this, so the usefulness of this treatment is doubtful.



The two sides of the PCB.

The first step
There is no provision on the PCB to temporarily disconnect the two amplifiers from the power supply. Therefore, it is not possible to adjust the quiescent current through the output stages when the amplifier is built. An ammeter in the positive supply line always measures the sum current of both amplifiers. According to information we found on the internet, the quiescent current should be equal to 0.7 A per channel at 25 V supply voltage. Apparently, this current will flow through the output stage if you set the adjustment potentiometer R8 (2 kΩ) to a value of 930 Ω. From the picture below you can see between which terminals you have to measure this resistance value. Pay attention to the position of the adjustment screw, also when you solder these parts on the PCB!



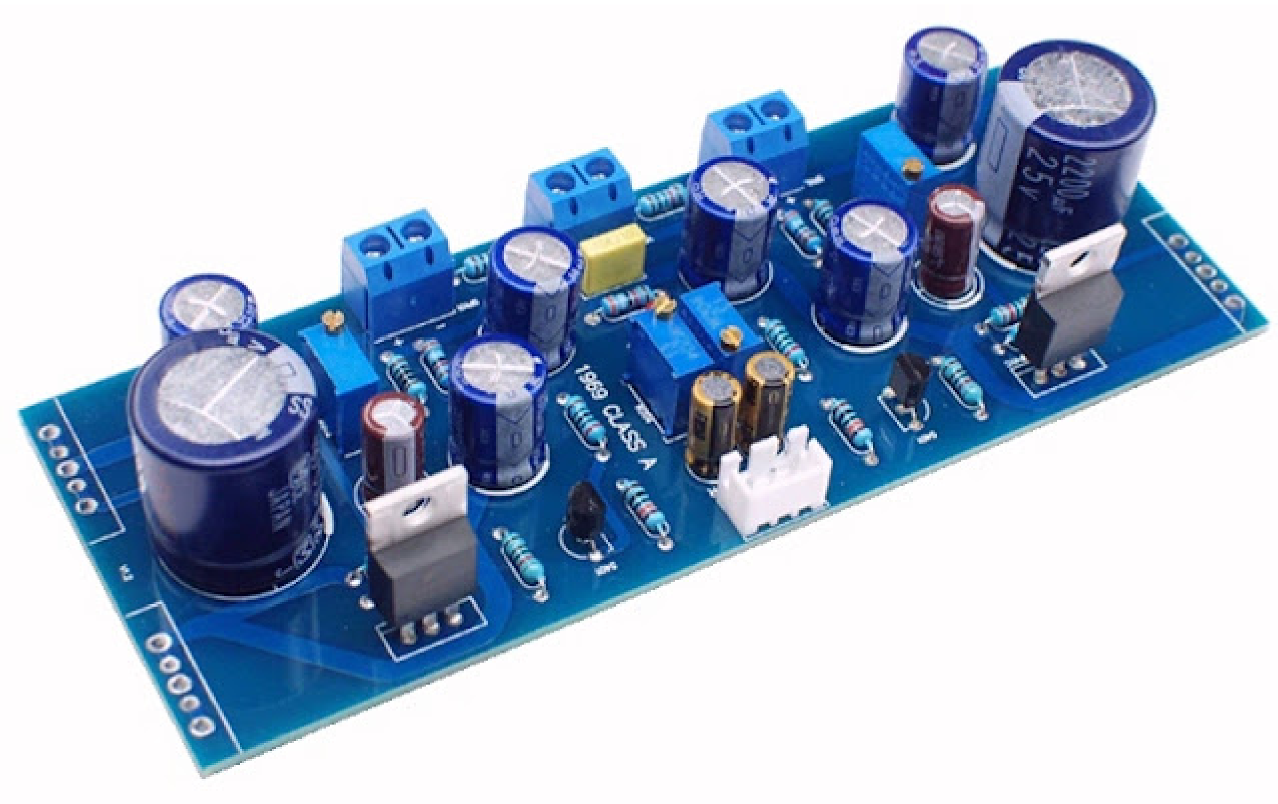
Adjustment of the R8 potentiometer.

Assembling the PCB
Based on the picture below you can solder all components, except the four power transistors, in this order on the PCB:

- 17 resistors
- 1 LED, the cathode is the shortest connection wire
- 1 capacitor 100 nF

- 2 transistors 2N5401
- 3 printed circuit board terminal blocks
- 4 trimmer potentiometers, pay attention to the position!
- 12 elco's, mind the plus and the minus!
- 2 transistors TIP41C, pay attention to the position of the cooling tab!

A handy tip: do not cut the positive wires of the two electrolytic capacitors C5 (2,200 µF), but bend them to the sides of the PCB so they stick out. You can use these '*adjustment points*' afterwards to adjust the ½Ub at the junction of the power transistors.
To connect the two input signals, a three-pole PCB header is supplied. Unfortunately, a cable connector for this is missing. Whether this is a convenient option in your case is up to you to decide. However, the three holes are very close together and the pads are much too small to fit solder tabs in the holes. So there is hardly any other option than to use the header.



The complete soldered circuit board.

Mounting the four power transistors
The four power transistors are screwed to the sides of the heatsink using the four insulating plates provided. However, do not screw these parts tightly yet, but loosely enough so that they can still move. The idea is to push the 4 x 3 connection wires through the twelve holes of the PCB. You must do this in such a way that the PCB is about one centimeter above the heatsink and is of course completely parallel to this heatsink. When you have done that (you will have to bend the wires of the power transistors a bit and move the transistors to the left or to the right) you can solder the wires of the four transistors on the PCB. Then screw the semiconductors tightly onto the heatsink.
Remember that the cooling tab of the TTC5200 transistor is connected to the collector and that it is absolutely necessary that you insulate the four semiconductors on the heatsink.
In the picture below, between the two transistors, you can see the bent-up connecting wire of one of the capacitors C5 that you can use to adjust the trimmer potentiometer R1.



Mounting the power transistors.

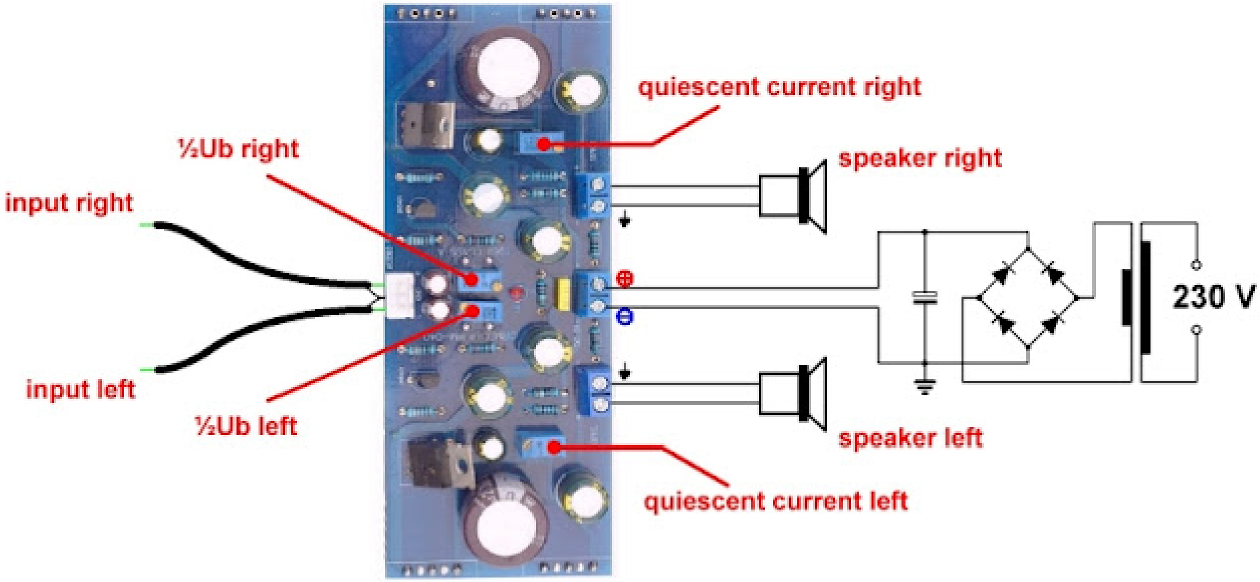
The completely assembled amplifier
In the picture below you can see the end result of the building of this Linsley-Hood 1969 amplifier.



The completely assembled Linsley-Hood 1969 amplifier.

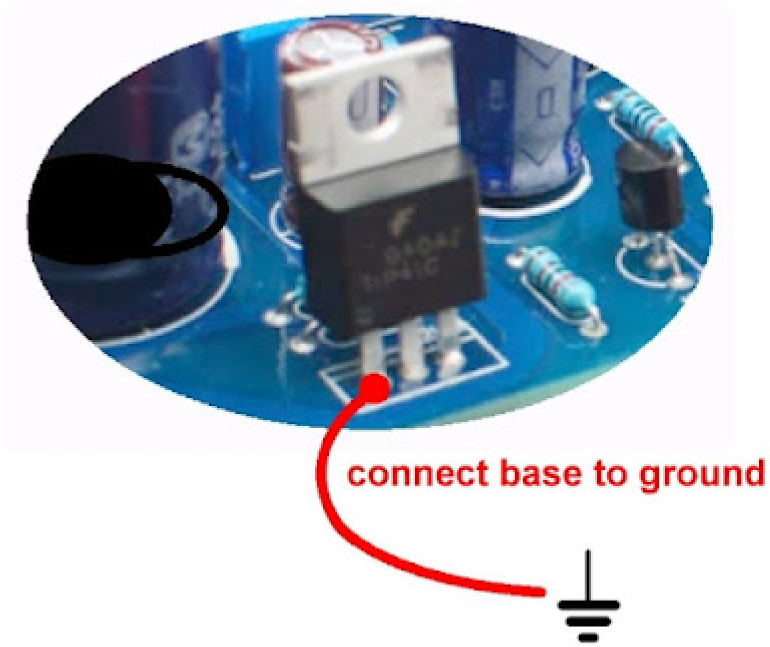
Adjusting the amplifier
Connect the two inputs to ground and connect the PCB to an adjustable DC power supply that can deliver at least 2 A. Connect a DC multimeter between the ground and one of the wires sticking out left and right. Slowly increase the output voltage of the power supply to, for example, 12 V. Now turn the screw of the R1 trimmer potentiometer of the relevant channel until the meter reads 6 V. Then slowly increase the supply voltage to a maximum of 30 V and check during this process that the measured voltage remains approximately equal to half the supply voltage and that the current does not exceed 2 A. If necessary, adjust the trimmer potentiometer until the meter indicates half the supply voltage again.
Repeat for the second channel.

The wiring diagram
In the figure below, we have drawn the wiring diagram of this amplifier. Please note that both loudspeaker outputs are grounded with one pole. Also the negative pole of the power supply and the middle contact of the input connector are grounded. You must connect the shielding of the two input cables to this pin of the PCB header. To avoid ground loops, leave one of these shields open on the other side of the cable.
You should not feed the amplifier from a modern switched mode power supply, the chance that HF interference will penetrate the amplifier is very high. So you must use an old fashioned linear power supply, consisting of a 50/60 Hz transformer, a bridge rectifier and a large smoothing capacitor. The amplifier can be powered with a maximum DC voltage of 35 V. This means that you can use a transformer with an unloaded secondary winding of 24 V maximum. This transformer must be able to deliver 3.0 A.



Wiring diagram of the amplifier.

Setting the quiescent current after building the amplifier
It suffices to connect the base of transistor T2 (TIP41C) to ground to cut off the current through the output stage of the amplifier in question. So if you want to adjust the quiescent current of the right amplifier, you have to ground the base of TIP41C of the left amplifier. A ammeter in the positive supply line of the power supply measures only the quiescent current of the right amplifier. You can then set the quiescent current of the amplifier with the trimmer potentiometer R8. Moreover, the specified value of 700 mA appears to be too low for maximum power, you better set the quiescent current to 1.0 A.



This is how you switch off one of the amplifiers.